UNIVERSITY OF ILLINOIS,

Agricultural Experiment Station.

CHAMPAIGN, APRIL, 1892.

BULLETIN NO. 20.

FIELD EXPERIMENTS WITH CORN, 1891.

This bulletin gives the results of the experiments with field corn in 1891, together with a summary of the results obtained in the same experiments in 1888, 1889 and 1890. The following are reported:

No. 1. Test of varieties.
No. 3. Time of planting.
No. 5. Thickness of planting.
No. 6. Planting in hills or drills.
No. 7. Depth of plowing.
No. 9. Depth of cultivation.
No. 10. Effect of root-pruning.
No. 11. Effect of fertilizers.
No. 90. Growth of the corn plant; increase of its dry matter.
No. 134. Effect of removing tassels.

The experiments, except No. 11, were tried on the dark colored, fertile prairie soils common to central Illinois. The surface soil is about 18 inches deep, underlaid with yellow clay. No manures were applied, except in No. 11. In most cases the land had been in corn in 1890, and was plowed in the spring. In all but a few cases the corn was planted by hand, covered with a hoe, four kernels in hills 3 ft. 8 in. apart each way.

The season was one of severe drouth. The rainfall had been deficent in 1890 and in the early months of 1891. For the five months from May to September it was 7.65 in., the average for this portion of the year being from 18 to 20 in. The average mean temperature for these five months was 68°, which is not far from the average during a series of years.

TEMPERATURE AND RAINFALL DURING THE CORN SEASON OF YEARS NAMED.

	Mean temperature, F.					
Year.....	May.	June.	July.	August.	Sept.	Average.
1887.....	67.9°	73.6°	80.4°	75.2°	66.4°	72.7°
1888.....	59.4°	71.3°	77°	72.4°	62.4°	68.5°
1889.....	59.2°	65.5°	72.7°	69.2°	61.3°	65.6°
1890.....	58.3°	74.6°	73°	68.7°	60.5°	67°
1891.....	58.4°	72°	70°	70.2°	69.2°	68°
Average, 1878–87.....	64.6°	71°	77.5°	74.6°	66.5°	70.8°
	Rainfall, inches.					Aggregate
1887.....	3.84	1.62	1.65	2.56	3.68	13.35
1888.....	6.84	5.75	5.34	3.14	1.95	23.02
1889.....	5.52	6.81	5.84	0.60	2.74	21.51
1890.....	3.56	3.80	2.83	1.93	1.19	13.31
1891.....	0.89	2.08	1.41	2.86	0.41	7.65
Average, 1878–87.....	4.45	5.04	2.75	3.45	3.27	18.96

Thirty-six varieties were tested on 52 plats. About 86 per cent of a full stand of stalks was secured. About 12 per cent of the stalks produced no ears. This is nearly the same result as found in 1888 and 1890; in 1889 there was less than two per cent of barren stalks. While the percentage of stalks does not seem to depend on variety, there were great differences in different plats—from three to twenty-nine per cent.

As had been the case in each of the three preceding years, the varieties maturing about September 20th gave a larger average yield than those maturing either earlier or later. In 1891, 13 early varieties averaged 56, 19 medium averaged 66, and six late maturing varieties averaged 57 bu. of air-dry corn per acre. For the four years the early varieties gave an average yield of 61, the medium of 73, and the late of 68 bu. of air-dry corn.

For four successive years 11 varieties have been tested. The average yield has been at the rate of 70 bu. per acre. Of these varieties champion white pearl has had the highest average, 79 bu.; Leaming (yellow) the next, 76 bu.; Burr's white, which resembles champion white pearl, next, 74 bu. Boone county white gave much the largest yield, 89 bu., in 1891, and as large as any other in 1890. Leaming gave the largest yield of any yellow variety in 1891. Murdock and Edmonds stood highest in yield of the early maturing varieties tested for four years. A plat of Murdock did not ripen until Sept. 20th, while one plat of Leaming matured so as to be classed with the early varieties; but these were exceptional cases.

In some cases marked differences were found in the yield of adjacent plats of the same variety. In the case of one variety there have

been extraordinary variations in yield in different years. In each of the four years varieties little known and without more than a neighborhood reputation have given large yields of good corn. The yield does not seem to depend on the color or the smoothness or roughness of the kernels, although, in 1891, the white varieties gave an average of four bushels larger yield than the greater number of yellow varieties.

A medium sized variety of corn planted at the rate of one kernel each nine to twelve inches in rows 3 ft. 8 in. apart gave larger yields of good corn than thicker planting; but the yield of corn and stalks together increases with thickness of planting, at least up to the rate of one kernel each three inches. As the result of four years trials it is believed the larger yield of grain makes the food value of the total crop greater when it is planted at the rate of one kernel at about each six inches in the row.

In 1891 little difference was found in yield from plats planted with a medium maturing variety at weekly intervals from April 25th to May 23d. Later plantings gave much smaller yields; the ears were not well filled and the corn did not mature thoroughly. For three years previous good crops were had from plantings any time in May. For the four years the best results have come from planting from May 11th to 16th.

In two out of three years no material difference in yield has been found whether the corn has been planted in hills or drills, if the land was kept equally free from weeds.

The yields were nearly the same from three plats of spring-plowed land, one plowed two, and one five, and one ten in. deep. In 1890 land plowed eight inches deep gave a little larger yield than that plowed shallower.

In 1891, for the first time in four years, there was a larger yield from a plat deep cultivated than from one shallow cultivated. A cultivator with narrow spring teeth was used this year in the deep cultivation; in former years, a shovel cultivator. For four years the average yields have been at the rate of 71 bu. from deep, 76 from shallow cultivated plats, and 73 from plats not cultivated except to remove weeds by scraping the surface with a hoe.

No appreciable effect on yield of field corn resulted from cutting the tops when in good condition for fodder, or from removing the tassels from alternate rows as they appeared.

Experiments made for three years illustrate the fact that there is relatively little dry matter in corn during the early stages of its growth. When it had reached half its height it had not more than seven, in full tassel less than 50, and when in the soft milk stage less than 75 per cent as much dry matter as when fully mature. Unless there is loss by dropping of leaves the dry matter increases until the corn is mature.

Experiment No. 1. Corn, Testing Varieties.

Tests of varieties of dent corn have been made for five years. Reports have been made in bulletins No. 4, 8 and 13. During the past

two years the number of varieties has been considerably reduced by sifting out those that did not give promise of any special merit. In 1888, 136 varieties were tested, in 1891, 36.

The land used in 1891 had been in corn in 1890 and was fall-plowed. The plats, 53 in number, were each one-fortieth of an acre, 2 rods or nine hills square, and with few exceptions were so planted that corn was growing on every side. May 9th to 14th the plats were disked twice, harrowed once, marked 3 feet 8 inches each way; and the corn was dropped by hand four kernels in a hill and covered about one inch deep with a hoe. May 23d to July 1st all the plats were cultivated three times with a shallow-going cultivator and the weeds remaining were removed with a hoe. When the corn was about ten inches high the number of plants on each plat was counted. After September 5th observations as to ripeness were frequently made. The number of barren stalks, total number of stalks, average height to tip of tassels and the average height to butt of ears were ascertained for each variety.

The plats were husked by thirds, the weight and number of ears being ascertained for each third. The middle third of each plat was taken to the storehouse where it remained for about three weeks, at the end of which time it was again weighed, and the number and weight of both nubbins and ears, and the weight of both shelled corn and cobs ascertained for each lot. A pint jar was filled with shelled corn from each plat and sent to the laboratory for the determination of water.

Duplicate Plats.

The differences in yield of duplicate plats show that, while the soil to all appearances was uniform, and the treatment throughout the same, there are differences of condition that are beyond our control and, not unfrequently, beyond our discovery. There were two or more plats of each of ten varieties. The greatest difference in yield between two plats of the same variety is 20.1 bu. per acre, the average difference, 5.8 bu.; and the least difference 0.3 bu.

Yield per Acre of Air-dry Corn upon Duplicate Plats, in 1891.

Variety.	a	b	c	d	Average
Leaming	54.7	72.3	74.8	.....	67.3
Legal tender	56	57.6	.....	.....	56.8
Murdock	62.1	61.8	57.6	57.9	59.8
Edmonds	56.4	60.8	.....	.....	58.6
Golden beauty	72.2	79.4	.....	.....	75.8
Champion white pearl	73.6	79.5	.....	.....	76.5
Burr's white	65	70.5	.....	.....	67.7
Blue river	65.7	74.9	.....	.....	70.3
Hickory king	54.6	57.9	.....	.....	56.2
Helms improved	40.5	37.4	.....	.....	39

While these differences are considerable, yet they are much less than those found between different varieties of even the same class.

For example, the greatest difference between two plats of the 14 planted to early maturing varieties was 39.7 bu. per acre; of the 26 medium maturing, 35.7 bu.; and of the 9 late maturing, 42 bu. The variety giving the largest yield produced 2.6 times as much as the one giving the least. When the variation in yield of different varieties does not exceed that of the same variety on different plats the results are inconclusive. A greater variation we must attribute, in part at least, to the variety. If single plats are used, it is only after varieties have been tested for a series of years that we can conclude which give the best yields; but there are other important things which can be ascertained by comparative tests; such as time of maturity, size, ratio of ears to stalks, ratio of shelled corn to cob. If several plats of each variety are planted, and the average yields ascertained, these afford a better basis for a comparison of the varieties in respect to yield; for in this way the effect of differences in the conditions of the test is much diminished.

Classification of Varieties.

The table on page 54 gives a classification of the varieties tested this year and the yield of air-dry corn by each variety. It is based upon the time of ripening, color and smoothness or roughness of the outer end of the kernels. Varieties maturing before September 10th are classed as early; those maturing September 11th to September 20th as medium; and those maturing after September 21st as late. The varieties that are very near the dividing lines as to time of maturity, and smoothness or roughness are subject to change from year to year from one class to another, hence we see that the classification for 1891 differs slightly from that of 1890. In two cases duplicate plats of the same variety ripened so as to be classed differently.

Results.*

A summary giving the number of plats in each of the three classes, early, medium and late, and the results for each class for each of four years, is given in the table on page 55. In each of the four years there has been an average of from four-fifths to seven-eighths of a full stand, i. e., four stalks in each hill. In two years, 1888 and 1889, there were more stalks when the corn was ripe than when well up in the spring, showing that some stooling must have taken place. And from the very low per cent of barren stalks in 1889, 1.5, we must conclude that most of the stalks produced by stooling must have borne ears. For 1888, 1890 and 1891 the per cent of barren stalks is comparatively uniform, averaging about 12, and in each of these years it increases with the lateness of maturity.

Though varying much from year to year, owing to the nature of the season, in general the height of both stalks and ears increase with lateness of maturity, as do also the length and circumference of ears. Hickory king, a very late maturing variety, is considerably smaller than

*For details see pp. 56-59.

SYNOPSIS OF VARIETIES, 1891.

					Yield.
Corn	Early	Yellow	Smooth	Haber's early dent	58.2
				Early Butler	52.2
				Murdock	57.9
				Leaming	54.7
			Rough	Queen of the field	61.4
				Hathaway's early dent	35.4
				Steward's improved yellow	58.4
				Yellow dent	62.6
				Queen of the North	34.3
				Edmonds	58.6
				Champaign	61.3
		White	Smooth	Clarke county champion	57.5
				Dunlap's white	74
	Medium	Yellow	Smooth	Fisk	57.4
				Munns	69
				Murdock	60.5
				Clark's Onarga	63.8
				Clark's Iroquis	65.4
				Clarage	53.6
				Leaming	73.5
				Legal tender	56.8
			Rough	Riley's favorite	56.1
				Chester county mammoth	60.1
				California yellow	69.8
		White	Smooth	Peck's white	55.3
				Huston's white	65.3
				Boone county white	89.3
				Burr's white	67.7
				Champion white pearl	76.5
			Rough	McMillan's white	75.8
				Fisk	65.3
		Mixed	Smooth	Blue river	70.3
	Late	Yellow	Smooth	Pride of Kansas	64.1
				Golden beauty	75.8
		White	Smooth	Helms improved	39
				Hickory king	56.2
			Rough	Ivory dent	66.2
		Mixed	Rough	Cranberry	44.4

the average late maturing variety, and as it comes in twice in a short list of late maturing varieties it reduces the average size.

In general the weight of 100 ears has increased, and the number of ears per acre decreased with the lateness of maturing. The pounds of ear corn, as weighed when husked, which must be taken to make a bushel of air-dry shelled corn, invariably increases with the lateness of maturity. This is due largely to the fact that the per cent of water is greater in the late maturing varieties when husked. In two years of the four the pounds of ear corn as shelled required to make a bushel of air-dry shelled corn was less in the late maturing varieties than in the medium.

SUMMARY OF RESULTS WITH THE THREE CLASSES—EARLY, MEDIUM, AND LATE MATURING—FOR EACH OF FOUR YEARS.

	Average of plats, 1888.			Av. of plats, 1889.			Av. of plats, 1890.			Av. of plats, 1891.		
	27 early.	32 medium.	15 late.	3 early.	42 medium.	22 late.	14 early.	29 medium.	8 late.	13 early.	19 medium.	6 late.
Per cent kernels germinating in apparatus	96	97	90	93	97	96	96	94	93	.....	.....	.....
Per cent germinating in field	84	80	74	70	68	65	81	86	81	87	88.4	87
Per cent full stand of stalks	88	87	85	84	80	78	79	83	79	86.1	86.4	84
Per cent of barren stalks	8	11	13	1.7	1.2	0.5	10	12	13	10.4	12.6	14.8
Average height of stalks, feet	9.8	11.5	12.2	6.9	8.9	9.9	8.1	9.6	10.1	6.8	7.7	8.6
Average height of butt of ear, feet	4.5	5.5	6.2	2.8	4.2	4.7	3.5	4.5	5.2	3.4	4.2	4.3
Average height of 3 specimen ears, inches	8.3	9	9.7	7.4	8.1	9.6	8.1	8.3	8.4	7.6	8	7.5
Average circumference of 3 specimen ears, inches	6.3	7	7.2	6.2	6.4	7.2	6.4	6.6	6.2	6.2	6 6	6.2
Average circumference of 3 specimen cobs, inches	3.7	4	4.2	3.4	3.9	4.3	3.7	3.8	3.3	3.7	3.9	3.9
Number of good ears per acre	7597	7482	6263	6520	6695	6055	5374	5292	4651	5464	6334	5112
Number of nubbins per acre	2948	2741	2745	3360	3535	3840	3610	3749	3806	4088	3400	3400
Total number of ears per acre	10545	10223	9008	9880	10230	9895	8984	9041	8457	9552	9734	8513
Weight of 100 good ears, lb	60	74	93	46	72	81	55	61.3	60.1	49.6	58.6	61.3
Weight of 100 nubbins, lb	35	33	51	26	40	43	28	31.9	34.1	28.5	31.6	33
Weight of 100 average ears, lb	53	68	80	39	61	67	44	50	48.7	40.2	48.8	49.8
Lb. ear corn to make bushel when husked	67.2	68.4	71.4	66.1	69.6	72	66.2	67.2	67.1	*66.3	*69.3	*67.7
Lb. ear corn when husked to make bushel air-dry	73.3	78.1	87.8	70.6	81.1	90.2	70.4	73.3	78	72	75.8	86.8
Yield per acre from good ears, bushels	67.5	84	81.2	45.8	68.8	70	44.5	50	47.1	.....	.....	.....
Yield per acre from nubbins, bushels	15.1	18	20.4	13.5	19.7	22.2	14.8	17.7	18.5	.....	.....	.....
Yield per acre, total when husked, bushels	82.6	102	101.6	59.3	88.5	92.2	59.3	67.7	65.6	*58.2	*69.9	*63.9
Yield per acre air-dry corn, bushels	75.6	89.8	83.2	55.6	75.4	73.5	55.6	62	56.6	56.1	66.1	57.4
Loss in drying in crib first year, bushels	7	12.2	18.4	3.7	13.1	18.7	3.7	5.7	9	.....	.....	.....
Per cent of water in corn when husked	18.3	21.8	27.2	16.6	23.8	28.8	16.5	18.4	23.2	*14.3	*15.9	*20.3

* When shelled.

Plat.	Name of Variety.	Seed Received From.		Percentage germinating in field.	Percentage of full stand of stalks.	Percentage of barren stalks.	Height, ft. Stalks.	Height, ft. Ears.	Average of 3 specimen ears. Length of ear, inches.	Circumference of ear, in.	Circumference of cob, in.
	Yellow dent varieties.										
1	Leaming	University farm	Champaign, Ill	96	92	9	6.8	3.2	7.9	6.3	4.1
2				92	....	....	6.7	3.7	....	....	....
3	Champaign	University farm	Champaign, Ill	93	98	13	7.8	3.5	7 9	6.2	3.7
4				89	....	....	7.3	3.3	....	....	....
5	Legal Tender	Nims Bros.	Emerson, Ia.	92	90	22	7.5	4.5	7.7	8.6	4
6				90	....	....	7.6	3.6	....	....	....
7	Murdock	University farm	Champaign, Ill	92	91	6	7.4	3.2	7.5	6.2	4
8				88	....	....	7.8	3 6	....	....	....
9	Edmonds	H. P. Edmonds.	Taylor, Ill.,	91	88	15	7.4	3.5	7.4	6.2	3.6
10				86	....	....	7.4	3.9	....	....	....
11	Queen of the field	Clement Freeman	Princeton, Ill.	93	91	4	7.4	3.4	7.6	6.1	3.7
12				92	....	....	6.8	3.4	....	....	....
13	Golden beauty	J. C. Suffern	Suffern, Ill.	93	86	10	8.9	4.1	8	6.3	3.6
14				84	....	....	9	4.7	....	....	....
15	Leaming	University farm	Champaign, Ill.	96	92	11	8.4	4.3	8.4	6.6	3.8
16				93	....	....	8.3	4.3	....	....	....
23	California yellow	Nims Bros.	Emerson, Ia	89	87	8	8.2	4 8	7.2	6.5	3.7
24	Clarage	A. W. Livingston's Sons	Columbus, Ohio	93	81	13	7 8	3.5	7.7	6.2	3.1
25	Clark's Iroquois	H. H. Clark	Onarga, Ill.	86	85	17	7.6	4	8.4	6	3.6
26	Clark's Onarga	H. H. Clark	Onarga, Ill.	93	93	13	8.1	4.5	7.6	6	3.4
27	Chester county mammoth	J. C. Vaughan	Chicago, Ill.	74	71	14	7.7	3.7	8.5	7.1	4.3
28	Pride of Kansas	Samuel Wilson	Mechanicsville, Pa	81	82	16	8.7	3.9	8.6	6.7	4.3
29	Early Butler	J. J. H. Gregory	Marblehead, Mass	84	96	15	5.7	3.3	7.4	6	3.7
34	Murdock	University farm.	Champaign, Ill	92	87	9	7.6	4.2	7.3	6.4	3.9
35	Riley's favorite	Jas. Riley	Thorntown, Ind	81	73	22	7.5	4	7.8	6.7	4
36	Munns	Jas. Riley	Thorntown, Ind	95	95	6	7.9	4.2	8.1	6.2	3.9

37	Fisk's yellow	Eli Fisk	Havana, Ill	87	86	22	8.1	3.6	7.9	6.1	3.6
38	Yellow dent			86	79	8	8.3	3.6	7.9	6.5	3.8
46	Steward's imp. yellow	L. W. Steward	Amanda, Ohio	93	90	15	8	3.9	7.4	6.4	3.6
47	Haber's early dent	K. B. Moorhouse	Urbana, Ill.	95	95	8	7	3.4	7.6	5.9	3.7
48	Hathaway's early dent	D. M. Ferry	Detroit, Mich.	61	54	8	6.6	3.1	7.5	6.2	3.9
49	Murdock	University farm	Champaign, Ill.	91	90	12	7.7	3.6	7.5	6.2	3.7
50	Queen of the north	Salzer Seed Co	La Crosse, Wis.	71	77	10	5.6	2.4	7	5.8	3.4
	White dent varieties.										
17	Champion white pearl	J. C. Suffern	Suffern, Ill.	83	103+	25	7.6	3.7	8.6	6.5	3.8
18	Champion white pearl	J. C. Suffern	Suffern, Ill.	85	.....	....	6	3.5	....	....	....
19	Burr's white	University farm	Champaign, Ill.	89	91	12	8.2	3.8	8.4	6.7	4
20	Burr's white	University farm	Champaign, Ill.	87	.....	....	8.1	3.9	....	....	....
30	Hickory King	Samuel King	Mechanicsville, Pa.	84	76	13	8.7	4.5	7.1	5.9	2.9
31	Dunlap's white	H. M. Dunlap	Savoy, Ill.	92	91	9	8.5	3.7	7.6	6.2	3.6
32	Boone county white	Jas. Riley	Thorntown, Ind.	88	80	3	8.7	4.7	7.7	6.7	4.1
33	Ivory dent	R. H. Vanderhoof	Newton, Ill.	88	92	16	8.6	4.5	7.2	6 6	4.1
39	Clarke county champion	J. M. McCullough	Cincinnati, Ohio	72	79	10	7.6	3.8	7.6	6.1	3.8
40	Fisk's white	Eli Fisk	Havana, Ill.	85	79	14	8.9	4.7	8.7	6.6	4.2
41	Hickory King	Samuel Wilson	Mechanicsville, Pa.	79	75	9	8.7	4.2	7.2	5.7	2.9
42	McMillan's white	C. McMillan	Champaign, Ill.	85	80	3	8.8	4.1	8.3	6.8	4.1
43	Huston's white	W. H. Coffman	Champaign, Ill.	87	88	6	8.7	4.1	....	....	....
44	Helms improved	Fred Helms	Belleville, Ill.	85	92	12	9.6	4.8	....	....	....
51	Peck's white	K. B. Moorhouse	Urbana, Ill.	90	87	15	7.4	4.4	7.6	6.2	3.8
52	Helms improved	Fred Helms	Belleville, Ill.	95	89	29	8.5	4.2	7.2	6.1	3.9
	Mixed dent varieties.										
21	Blue river	Percival Bros.	Champaign, Ill.	90	89	12	7.9	3.4	8.2	6.8	4.5
22	Blue river	Percival Bros	Champaign, Ill.	89	.....	....	7.7	3.7	....	....	....
53	Cranberry	J. C. Vaughan	Chicago, Ill.	93	85	14	7.2	3.9	6.2	6.4	4.6

VARIETY OF CORN; POUNDS OF EAR CORN WHEN HUSKED, WHEN SHELLED; POUNDS OF EAR CORN PER BU. WHEN SHELLED; BUSHELS SHELLED CORN PER ACRE; TOTAL AIR-DRY CORN; LOSS IN DRYING, 1891.

Plat No.	Name of Variety.	Per ct. water in shelled corn when husked.	Lb. ear corn per acre when husked.	Lb. ear corn per acre when shelled.	Lb. ear corn per bu. when shelled.	Lb. when husked to make bushel air-dry.	Bu. shelled corn per acre. Total as shelled.	Total air-dry.	Loss in drying.
1	Leaming	15.1	4140	3954	68.9	75.7	57.3	54.7	2.6
2	Leaming	....	4290	....	....	....	....	....	....
3	Champaign	15	4500	4250	66.2	73.4	64.2	61.3	2.9
4	Champaign	....	4800	.....	....	....	....	....	....
5	Legal tender	19.4	4260	4052	65.5	76.1	61.8	56	5.8
6	Legal tender	15.9	4320	4034	66.1	75	61	57.6	3.4
7	Murdock	17	4800	4560	68.5	77.3	66.5	62.1	4 4
8	Murdock	18.1	5100	4615	68.7	82.7	67.2	61.8	5.4
9	Edmonds	13.3	3900	3780	65.3	69.1	57.9	56.4	1.5
10	Edmonds	14	4350	4135	65.8	71.5	62.9	60.8	2.1
11	Queen of the field	....	4050	3896	67.1	....	58.1	....	....
12	Queen of the field	14.9	4480	4289	66.7	73	64.4	61.4	3
13	Golden Beauty	17.6	6000	5227	67	83.1	78	72.2	5.8
14	Golden Beauty	18.5	6800	5828	67.2	85.6	86.7	79.4	7.3
15	Leaming	16	5550	5184	67.6	76.8	76.6	72.3	4.3
16	Leaming	15.3	5720	5291	67.3	76.5	78.6	74.8	3.8
17	Champion white pearl	15	5460	5038	65.4	74.2	77	73.6	3.4
18	Champion white pearl	15.3	5880	5470	65.5	74	83.5	79.5	4
19	Burr's white	14.1	4830	4527	67.2	74.3	67.4	65	2.4
20	Burr's white	11.1	4920	4699	66.6	69.8	70.6	70.5	.1
21	Blue river	13.8	4860	4616	68.1	74	67.8	65.7	2.1
22	Blue river	15.5	5480	5257	67	73.2	78.5	74.9	3.6
23	California yellow	15.2	5040	4772	65.3	72.2	73.1	69.8	3.3
24	Clarage	14.6	3900	3721	66.6	72.8	55.8	53.6	2.2
25	Clark's Iroquis	16.2	4860	4544	65.5	74.3	69.4	65.4	4
26	Clark's Onarga	16.1	4680	4364	64.5	73.4	67.7	63.8	3.9
27	Chester county mammoth	17.2	4740	4314	66.8	78.9	64.6	60.1	4.5
28	Pride of Kansas	19.1	5550	4860	68.8	86.8	70.5	64.1	6.4
29	Early Butler	13	3600	3484	65.2	69	53.4	52.2	1.2
30	Hickory king	22.5	4800	4220	63.5	82.9	66.5	57.9	8.6
31	Dunlap's white	14.8	5400	5184	67.1	73	77.2	74	3.2
32	Boone county white	17.2	6930	6422	66.9	77.6	96	89.3	6.7
33	Ivory dent	18.5	5460	4980	68.4	82.5	72.9	66.2	6.7
34	Murdock	15 4	4500	4212	69.6	78.1	60.6	57 6	3
35	Riley's favorite	14.5	4020	3864	66.1	71.7	58.4	56.1	2.3
36	Munns	14.4	4920	4715	67.3	71.3	70.1	69	1.1
37	Fisk's yellow	18.3	4440	4158	66.5	77.4	62.6	57.4	5.2
38	Yellow dent	14.8	4440	4254	65	70.9	65.4	62.6	2.8
39	Clarke county champion	13.2	4080	3965	67.2	71	59	57.5	1.5
40	Fisk's white	19.4	5700	5028	69.6	87.3	72.2	65.3	6 9
41	Hickory king	20.3	4500	3912	64.2	82.4	60.9	54.6	6.3
42	McMillan's white	16	5580	5300	66	73.6	80.3	75.8	4.5
43	Huston's white	18.3	5280	4892	68.8	80.5	71.1	65.3	5.8
44	Helms improved	24.6	4025	3412	71.4	99.4	47.8	40.5	7 3
46	Steward's improved yellow	16	4350	4106	66.3	74.5	61.9	58.4	3.5
47	Haber's early dent	14.4	4170	3967	63.5	71.6	60.5	58.2	2 3
48	Hathaway's early dent	13.0	2520	2428	67.1	71.2	36.2	35.4	.8
49	Murdock	16.3	4380	4135	67.1	75.6	60.4	57.9	2.5
50	Queen of the North	12.7	2340	2308	65.9	68.2	35	34.3	.7
51	Peck's white	15.8	4350	4044	68.4	78.6	59.1	55.3	3.8
52	Helms improved	21.7	3600	3048	71.9	96.2	42 5	37.4	5.1
53	Cranberry	20	3660	3000	66.8	82 4	49.4	44.4	5

NUMBER OF EARS PER ACRE, AND WEIGHT OF 100 EARS, 1891.

Plat.	No. of ears per acre.			Wt. of 100 ears, lb.			Plat.	No. of ears per acre.			Wt. of 100 ears, lb.			Plat.	No. of ears per acre.			Wt. of 100 ears, lb.		
	Good ears.	Nubbins.	Total.	Good ears.	Nubbins.	Average ears.		Good ears.	Nubbins.	Total.	Good ears.	Nubbins.	Average ears.		Good ears.	Nubbins.	Total.	Good ears.	Nubbins.	Average ears.
1	5,466	4,494	9,960	55.11	33.1	45.4	19	5,378	4,782	10,160	57.2	29.3	44.1	36	6,439	4,321	10,760	53.1	29	43.7
2	.....	.....	9,120	.....	.....	.....	20	4,885	5,395	10,280	55.6	29.3	42	37	5,785	3,215	9,000	56.6	31	47.5
3	5,412	4,948	10,360	47.7	22.3	37.3	21	5,804	4,796	10,600	55.4	32.8	45.2	38	6,283	3,877	10,160	52.4	36.2	39.8
4	.....	.....	6,600	.....	.....	.....	22	7,324	2,836	10,160	61.6	37.5	54.9	39	6,160	2,240	8,400	50.4	32.5	46
5	5,905	3,815	9,720	54.2	26.6	43 3	23	5,950	3,850	9,800	55.3	36.3	47.7	40	6,743	2,697	9,440	69.5	30	58.5
6	7,278	1,242	8,520	58.3	32.3	47.8	24	5,682	2,718	8,400	52.1	32.9	45.8	41	6,059	1,981	8,040	54.3	29.4	48.1
7	6,791	4,049	10,840	56.2	29	46	25	7,063	2,697	9,760	60	32.1	52.3	42	6,308	3,212	9,520	58.1	38.4	51.5
8	7,489	2,031	9,520	59.7	32.8	47.6	26	7,026	3,454	10,480	52.5	23.3	43.1	43	5,849	3,791	9,640	58.7	35.7	49.7
9	5,640	3,840	9,480	48.9	26.5	39.8	27	4,587	3,013	7,600	69.7	36	56.3	44	3,790	3,446	7,236	71.9	36.6	55.1
10	4,496	5,304	9,800	53.2	28.2	39.7	28	4,613	4,267	8,880	70	29	50.3	46	5,380	5,380	10,760	56.5	32.2	44.4
11	5,942	4,778	10,720	41.6	25.3	34.5	29	4,966	4,194	9,160	44.4	25.6	36.1	47	5,367	4,473	9,840	47.1	28.1	38.9
12	6,142	4,138	10,280	50 9	29.6	42.1	30	4,654	4,366	9,020	53.3	34.5	43.9	48	3,060	2,940	6,000	53	26.1	40.3
13	7,382	2,178	9,560	61	37.5	55.7	31	8,837	1,923	10,760	53.6	33.3	50.2	49	4,942	5,058	10,000	51.1	25.5	38.2
14	6,876	2,724	9,600	68.8	40.4	60.8	32	8,342	2,418	10,760	68.1	33.7	60.3	50	3,864	3 736	7,600	38.3	23.3	30.9
15	8,342	2,418	10,760	52.8	28.7	47.4	33	4,961	2,679	7,640	63.5	35.1	53.8	51	5,074	3,806	8,880	58.1	31.6	47.1
16	6,444	3,556	10,000	61.2	33.5	51.3	34	5,067	4,573	9,640	54.8	29	42.6	52	3,853	4,027	7,880	58	25.8	41.6
17	6,215	3,825	10,040	62.9	28.1	49.7	35	6,020	2,580	8,600	61.3	29.1	51.6	53	3,824	4,936	8,760	51.6	29.3	39
18	6,882	3,318	10,200	61.6	32.4	52.1														

Each year the medium maturing varieties have made the largest yield; the average yield of air-dry shelled corn for the four years being 73.1 bu. per acre, which is 12.4 bu. more than the average of the early maturing and 5.4 bu. more than that of the late maturing varieties.

The largest yield in 1891, 89.3 bu. per acre, was made on plat 32 by Boone county white, and exceeds by 9.8 bu. the next greatest yield, which was made on plat 18 by champion white pearl. Boone county white is a medium maturing variety, seed obtained from Jas. Riley, Thorntown, Ind., containing about an average of 17.2 per cent of water and a very low per cent (3) of barren stalks. Two plats only had a greater number of ears per acre, and one only, plat 14 of golden beauty, gives a greater weight per 100 average ears. This same variety also held a high rank in the preceding season, being exceeded by 3.5 bu. per acre only by the largest yield for that season. [See Bulletin No. 13.]

The following table gives the yield for each of eight varieties for five years, and of eleven for four years, arranged in the order of the average yield, beginning with the highest. Of these varieties, champion white pearl, Burr's white, and Helms improved are white; the remainder yellow. Murdock and Edmonds are early maturing, Helms improved is late, and the remaining ones are medium.

A comparison of the white and yellow varieties for 1891 shows an average yield of 64.3 bu. per acre for the white and 60.2 bu. for the yellow.

YIELD OF AIR-DRY CORN OF VARIETIES TESTED FOR THE YEARS NAMED.

Eight varieties tested in	1887.	1888.	1889.	1890.	1891.	Average.
Champion white pearl	20.2	70	94.8	74.9	76.5	67.3
Leaming	29.6	86.6	80.6	69.4	67.3	66.7
Burr's white	30.	85.9	75.7	67.7	67.7	65.4
Steward's improved yellow	32.4	91.2	68.7	54.7	58.4	61.1
Murdock	33.3	80.3	65	61.6	59.8	60
Legal tender	25.8	84.2	68.9	60	56.8	59.1
Edmonds	27.7	83.7	66.3	55.9	58.6	58.4
Riley's favorite	30.8	81.8	66.1	53.3	56.1	57.5

Eleven varieties tested in	1888.	1889.	1890.	1891.	Average.
Champion white pearl	70	94.8	74.9	76.5	79
Leaming	86.6	80.6	69.4	67.3	76
Burr's white	85.9	75.7	67.7	67.7	74.2
Helms improved	84.8	102.6	51.1	39	69.4
Fisk's yellow	76.6	79.5	61.7	57.4	68.8
Clark's Iroquois	68.5	81.9	59	65.4	68.7
Steward's improved yellow	91.2	68.7	54.7	58.4	68.2
Legal tender	84.2	68.7	60	56.8	67.4
Murdock	80.3	65	61.6	59.8	66.7
Riley's favorite	83.7	66.3	55.9	58.6	66.1
Edmonds	81.1	66.1	53.3	56.1	64.3

Experiment No. 3. Corn, Time of Planting.

Experiments to test the effect of time of planting on yield have been conducted for the past four years. Each year the corn was planted on

fall-plowed land and the plats were prepared in the same manner just before they were planted.

The ground used in 1891 had been in corn during 1890. The plats, eight in number, were each nine by thirty-six hills, or one-tenth of an acre, and were planted with a medium maturing variety of white dent (Burr's white) four kernels per hill, 3 ft. 8 in. apart each way. The first plat was planted April 25th, and one plat was planted each week thereafter till June 13th. All the plats were cultivated three times with a shallow-going cultivator and the weeds remaining were removed with a hoe. After the corn was well up the number of plants on each plat was ascertained. With the exception of plat 8, which had but little more than half a stand, there was from four-fifths to nine-tenths of a full stand. Beginning with June 8th the tallest stalk in each hill of one row running across the 8 plats was measured each week during the growing season. The average height in inches to the tip of tassel and upstretched leaf for each plat is given in the table for each week.

AVERAGE HEIGHTS TAKEN WEEKLY IN INCHES TO TIP OF TASSEL AND LEAF.

Plat.		Jun. 8.	Jun. 15.	Jun. 22.	Jun. 30.	July 6.	July 13.	July 20.	July 27.	Aug 3.	Aug 10.	Aug 17.	Aug 24.	Aug 31.	Sep. 7.	Sep. 21.
1	Tassel.	....	....	....	....	....	80	93	98	99	99	97	97	97	97	....
	Leaf...	26	40	58	81	86	93	98	99	99	100	97	97	96	95	....
2	Tassel.	...	....	....	....	....	65	84	96	96	97	96	96	95	95	....
	Leaf...	19	31	47	69	75	82	90	95	95	96	95	95	92	92	....
3	Tassel.	....	....	....	....	....	54	68	88	101	103	102	103	103	102	102
	Leaf...	14	23	36	59	67	75	85	94	100	101	102	100	99	98	98
4	Tassel.	....	....	....	....	....	....	53	69	89	97	96	98	98	97	97
	Leaf...	8	14	24	41	49	58	69	81	92	95	97	96	94	93	92
5	Tassel.	....	....	....	....	....	....	....	54	75	94	94	97	97	94	94
	Leaf...	4	9	16	31	39	46	58	73	84	93	94	95	94	93	91
6	Tassel.	....	....	....	....	....	....	....	....	....	58	78	95	97	96	97
	Leaf...	....	3	9	18	22	28	36	48	58	69	77	91	92	91	90
7	Tassel.	....	....	....	....	....	....	....	....	....	65	90	97	97	97	96
	Leaf...	....	....	9	18	24	32	40	54	64	77	88	93	93	93	92
8	Tassel.	....	....	....	....	....	....	....	....	....	....	72	87	96	96	96
	Leaf...	....	....	2	8	12	18	26	38	47	60	76	92	95	94	93

September 5th plats 1 and 2 were ripe, while an occasional husk of plat 3 was turning brown, the remaining plats being green.

October 13th plats 3 to 5 were ripe; 6 and 7, nearly ripe; and 8, quite green.

October 31st to November 2d the corn was husked and weighed, a fifty-pound sample from each plat being taken to the storehouse, where it remained for three weeks, when it was again weighed, shelled, both corn and cobs weighed, and a pint sample of the shelled corn sent to the laboratory for the determination of water.

The per cent of water increased with the lateness of planting. The reason it took so many pounds of ear corn from plat 8 as husked to make a bushel of air-dry shelled corn was not due wholly to the high per cent of water, but was in part because the cobs were not fully filled

with kernels. This was due probably to the ravages of some insects upon the silks during the period of pollenization. The same was true to a less extent of plats 6 and 7. There was but little difference in the yield of plats 1 to 5, but 6 to 8 were much lower in yield.

The average yields for the four years are in favor of planting from the 11th to 16th of May, any time in May being safe for a medium maturing variety; but either earlier or later than this there is some risk.

YIELD OF CORN AND PER CENT OF WATER IN CORN FROM PLATS PLANTED AT DATES NAMED, 1891.

Plat.	Dates.	When husked		When shelled.			Bu. per acre air-dry.
		Pounds ear corn per plat.	Pounds to make bu. air-dry.	Pounds ear corn per plat.	Per cent moisture in shelled corn.	Bu. shelled corn per acre.	
1	April 25	355	69.9	349.6	14	52.6	50.8
2	May 2	357	70.8	351.6	14.6	52.6	50 4
3	" 9	344	70.9	337.1	14.8	50.7	48.5
4	" 16	370	74.4	360.7	17	53.3	49 7
5	" 23	421	80	397.8	19.3	57.9	52 5
6	" 30	330	96.8	301.9	24	40	34.1
7	June 8	367	97.9	330.3	23.9	43.9	37.5
8	" 13	248	127.8	217	31.5	25.2	19.4

YIELD OF AIR-DRY CORN FROM PLANTINGS AT DIFFERENT DATES, 1888, 1889, 1890, 1891.

Dates.	Bushels air-dry corn per acre.				
	1888.	1889.	1890.	1891.	Average.
April 22-25	.....	52	.....	51	51
April 27-May 2	80	44	67	50	60
May 4-9	87	51	71	48	64
" 11-16	86	56	75	50	67
" 19-23	87	50	71	52	65
" 26-30	83	55	74	34	61
June 1-8	81	50	61	37	57
" 8-13	50	50	60	19	45

Experiment No. 5. Corn, Thickness of Planting.

On a tract of fall-plowed land 27 rows of corn 3 ft. 8 in. apart, were planted, three rows with single kernels three inches apart; three with single kernels six inches apart; and three with single kernels nine inches apart; also three rows with three kernels every nine inches; three with three kernels every 18 inches, and three with three kernels every 27 inches. This was at the rate of 47,520, 23,760, and 15,840 kernels per acre.

The weight of 100 ears, and of 100 stalks, the number of ears, and the bushels of corn per acre were greatest from the thinnest plantings, and least from the thickest plantings. The total yield and the yield of stalks was greatest from the thickest planting. Corresponding results have been secured in each of the three preceding years.

YIELDS OF CORN FROM PLATS OF THE SAME SIZE, AND WITH THE SAME NUMBER OF ROWS, BUT PLANTED WITH SEED VARYING IN AMOUNT, AND IN MANNER OF DISTRIBUTION, 1891.

Plat.	No. of kernels in hill.	Inches between hills.	No. of kernels planted per plat.	No. of stalks harvested.	Ratio of kernels planted to stalks harvested.	Lb. per acre stalks and corn.	Lb. per acre of stover.	No. of ears per acre.	Average wt. 100 stalks.	Average wt. 100 ears.	Ears harvested to 100 stalks.	Bu. per acre, 70 lb.
1	1	3	1,584	1,141	72	8,437.5	7,500	7,830	22	11.9	23	13.4
2	1	6	792	532	67.2	6,570	4,380	8,850	27.5	24	55	30.4
3	1	9	528	432	81.8	7,350	4,080	9,240	31.5	35.4	71	46.7
4	3	9	1,584	1,146	72.3	7,785	5,940	13,770	17	13.4	40	26.3
5	3	18	792	661	83.5	6,300	4,200	8,730	21	24	44	30
6	3	27	528	376	71.2	5,475	3,060	8,790	25	27.5	78	34.5

A second experiment was made to compare the effect of planting in hills at different distances and with differing numbers of kernels in the hills.

The tract used for this experiment had been in corn in 1890 and was fall-plowed. There were 36 plats, each nine hills square, so planted that corn grew on every side of each plat. May 14th the corn, which was Leaming and Burr's white, two medium maturing varieties, and early Butler, an early maturing variety, was dropped by hand and covered with a hoe. June 1st to 27th the corn was cultivated three times with a shallow-going cultivator and the remaining weeds removed with a hoe.

October 26th to 29th the corn was husked and the number of barren stalks, the total number of stalks, the number of ears and the weight of ears were ascertained for each plat. The distance between hills, the number of kernels per hill, the ratio of stalks grown to kernels planted, the per cent of barren stalks, the number per acre of kernels planted, stalks grown, and ears harvested, the weight of 100 ears, and the yield per acre in bushels (70 lb. per bushel) for each plat of each variety are given in the table.

In general, as the rate of thickness in planting increases the ratio of stalks grown to kernels planted and weight of 100 ears decrease, while the per cent of barren stalks increases. The same is more noticeable in the table giving the average of four plats for each of the six rates of planting. In this table also it will be seen that, excepting the thickest planting, the yield per acre increases with the increase in

rate of planting. For three kernels per hill the maximum yield is from hills three feet apart each way and the minimum from hills 3 ft. 8 in. apart each way. For four kernels per hill the maximum yield is from hills 3 ft. 8 in. by 3 ft., with but slight decrease for either of the other two distances.

Using only the medium maturing varieties there was an average yield of 64.3 bu. per acre from eight plats, planted at the rate of less than ten thousand kernels; from eight plats planted at the rate of eleven to thirteen thousand, 68.9 bu.; from ten plats planted at the

YIELDS FROM PLATS OF THE SAME SIZE PLANTED WITH CORN IN HILLS AT DIFFERENT DISTANCES APART, AND WITH A VARYING NUMBER OF KERNELS TO THE HILL, 1891.

Plat.....	Variety.	Distance between hills, feet and inches.	Kernels per hill.....	Ratio of stalks grown to kernels planted.	Per cent of barren stalks.....	Number per acre,			Weight of 100 ears in lb.....	Yield per acre, bu. (70 lb. per bu.)...
						Kernels planted.	Stalks grown.	Ears harvested.		
1	Burr's white....	3-8'x3-8'	4	82	9	12,960	10,600	8,840	55.9	70.6
2	"	" "	4	81	9	12,960	10,480	8,840	58.6	74
3	"	" "	3	93	9	9,720	9,120	7,920	57.5	65.1
4	"	" "	3	93	11	9,720	9,080	8,080	58.7	67.9
19	"	3-8'x3	4	68	6	15,840	10,804	8,849	53.1	67.2
20	"	" "	4	74	7	15,840	11,782	10,267	50.6	74.2
21	"	" "	3	87	10	11,880	10,364	8,898	55.1	70
22	"	" "	3	89	9	11,880	10,658	8,849	56	70.9
23	"	3 x 3	3	78	6	14,520	11,362	9,927	52.4	74.3
24	"	" "	3	81	9	14,520	11,720	9,867	49	69.2
25	"	" "	4	78	12	19,360	15,249	12,020	44.7	76.9
26	"	" "	4	78	15	19,360	15,069	12,139	37.5	65.1
31	"	" "	3	95	14	14,520	13,873	9,807	55	77.1
32	"	" "	3	81	7	14,520	11,780	9,927	53.8	76.5
33	"	" "	2	95	6	9,680	9,209	7,654	66.4	72.6
34	"	" "	2	87	3	9,680	8,432	7,116	66.6	67.6
35	"	" "	2	68	1	9,680	6,578	5,860	62.5	52.3
36	"	" "	2	84	1.5	9,680	8,133	7,834	58.2	65.1
5	Leaming.....	3-8'x3-8'	4	80	8	12,960	10,440	9,320	46.2	61.5
6	"	" "	4	85	8	12,960	11,120	10,480	47.9	71.8
7	"	" "	3	88	7	9,720	8,560	8,160	53.7	62.7
8	"	" "	3	89	8	9,720	8,720	8,280	51.9	61.4
15	"	3-8'x3	4	79	12	15,840	12,613	10,804	42.9	66.4
16	"	" "	4	82	8	15,840	13,004	12,076	44.3	76.4
17	"	" "	3	80	6	11,880	9,533	8,800	51.8	65.1
18	"	" "	3	84	4	11,880	10,071	9,436	49.7	67
27	"	3 x 3	3	85	11	14,520	12,438	10,166	49.2	71.5
28	"	" "	3	85	14	14,520	12,498	10,584	44.5	67.2
29	"	" "	4	80	14	19,360	15,548	12,498	39.5	70.7
30	"	" "	4	77	12	19,360	14,890	12,199	36.8	64.3
9	Early Butler....	3-8'x3-8'	5	66	10	16,200	10,760	9,800	35.1	49.1
10	"	" "	5	66	9	16,200	10,720	10,360	34.3	51.4
11	"	3-8'x3	4	71	11	15,840	11,342	10,022	34.1	48.8
12	"	" "	4	70	9	15,840	11,098	10,364	37	54.8
13	"	" "	3	85	4	11,880	10,071	8,849	37.4	48
14	"	" "	3	81	4	11,880	9,631	9,093	39.8	51.7

rate of fourteen to sixteen thousand, 72 bu.; and from four plats planted at the rate of about nineteen thousand kernels per acre, 69.2 bu.

This single experiment showed a slight increase in yield from planting two or three thousand kernels per acre more than when four kernels per hill are planted in hills 3 ft. 8 in. apart each way, but the increased labor in harvesting the larger number of ears may partially if not wholly, counterbalance the small gain.

AVERAGE YIELDS OF CORN FROM SIX GROUPS OF PLATS, FOUR IN EACH GROUP, PLANTED AT DIFFERENT RATES, 1891.

Varieties, Leaming and Burr's white.	Distance between hills, feet and inches.	Kernels per hill.....	Ratio of stalks grown to kernels planted.	Per cent of barren stalks.....	Numbers per acre. Kernels planted.	Stalks grown.	Ears harvested.	Weight of 100 ears in lb.....	Yield per acre, bu. (70 lb. per bu.)...
Av. of 4 plats, 2 L. & 2 B.-w..	3-8'x3-8'	4	82	8.5	12,960	10,660	9,370	52.1	69.5
" " " " ..	" "	3	90	9	9,720	8,870	8,110	55.4	64.3
" " " " ..	3-8'x3	4	76	8	15,840	12,051	10,499	47.7	71
" " " " ..	" "	3	85	7	11,880	10,156	8,996	53.1	68.2
" " " " ..	3 x 3	4	78	13	19,360	15,189	12,214	39.9	69.2
" " " " ..	" "	5	82	10	14,520	12,004	10,136	48.8	70.5

Experiment No. 6. Corn, Planting in Hills or Drills.

A tract of fall-plowed land, which had been in wheat in 1890, was planted May 18th with Burr's white, a part being planted in hills, 3 ft. 8 in. apart each way, and part in drills, the rows being the same distance apart, the intention being to drop one kernel each 12 inches. The planting was done with an ordinary check rowing planter with a drilling attachment.

The plats had like treatment, each being cultivated three times. The land was cultivated only one way. They were husked Oct. 22d, and the yields were exactly the same, 71.8 bu. per acre.

In 1890 there was a considerably larger yield from the corn in hills than from that in drills, and more when the corn in hills was cultivated both ways than when cultivated but one way.

Experiment No. 7. Corn, Effect of Depth of Plowing.

May 16, 1891, three equal and adjacent plats were plowed as nearly as possible at depths of 2, 5 and 10 inches and planted to corn. Oct. 23d, when harvested, they yielded, respectively, 54, 57.5, and 56 bu. per acre. The difference in yield was so slight that it cannot be said with confidence that the difference in the depth of plowing caused it.

In 1890 the yields from five adjacent plats, with seed-bed stirred to different depths, were as follows: Not plowed (disked shallow), 56.4; plowed 2 in., 59.9; plowed 4 in., 69.4; plowed 6 in., 69.3; plowed 8 in., 71.7 bu. per acre. None of these plats had any cultivation after ing, except removing the weeds by scraping the surface with a sharp

Experiment No. 9. Corn, Depth of Cultivation.

The tract used in this experiment was in corn in 1890 and was fall-plowed.

May 15th it was disked and harrowed, marked in rows 3 ft. 8 in. apart each way, and planted with Burr's white corn, four kernels per hill. The corn was dropped by hand and covered with a hoe. The tract was divided into four plats each 9x101 hills.

Plat 1 was cultivated shallow three times; plat 2, deep three times; and plat 3, deep once and shallow twice. The cultivation of the three plats was on the same days. After the last cultivation the weeds remaining were removed with a hoe. Plat 4 was uncultivated except by scraping the surface with a sharp hoe to remove weeds.

Oct. 23d the corn of each plat was husked and weighed separately, with the following results:

YIELDS OF CORN ON PLATS DIFFERENTLY CULTIVATED, 1891.

Plat No.	Kind of cultivation.	Corn per plat, lb. when husked.	Yield per acre, bu., (70 lb. per bu.)
1	Shallow	1,148	58.4
2	Deep	1,247	63.4
3	Deep and shallow	1,252	63.7
4	No cultivation	1,087.5	55.3

This experiment has been conducted for four years, and, using only the data for shallow, deep, and no cultivation, we have as follows:

YIELDS OF CORN ON PLATS DIFFERENTLY CULTIVATED, 1888-1891.

Kind of cultivation.	Bushels per acre.				
	1888.	1889.	1890.	1891.	Average.
Shallow, ordinary	93.8	84.6	66.8	58.4	75.9
Deep, ordinary	84.9	74.2	60.8	63.4	70.8
None, weeds scraped from surface	90	77.1	69.1	55.3	72.9

For each year, except 1891, the yields from the plats with deep cultivation have been inferior to those from plats with either shallow or no cultivation. The average for the four years shows the same result. In the deep cultivation for 1891 the "Daisy" cultivator, having small spring shovels, was used; while in each of the three preceding years the ordinary large shovel cultivators were used. The plat which had no cultivation in 1891 may have been somewhat affected by a row of trees.

Experiment No. 10. Corn, Effect of Root-pruning.

Every alternate row of eighteen rows two rods long, of each of the four plats described in experiment number 9, was root-pruned three times from June 19th to July 10th, to a depth of four inches. The

pruning was done by placing around each hill a frame twelve inches square on the outside and passing around its outer edge a gaged knife.

Up to the time of tasseling the effect of root-pruning was marked, the pruned rows being noticeably smaller than the unpruned ones; but after the tasseling the effect was less apparent. Oct. 17th and 19th the corn for each row of each plat was husked and weighed separately, with the results given in the following table:

EFFECT OF ROOT-PRUNING UPON YIELD OF CORN, 1891.

Row.		Yield of ear corn, pounds.					
		Plat 1.	Plat 2.	Plat 3.	Plat 4.	Sum of 4 plats.	Yield per acre bu. (70 lb.)
1	Pruned	12.25	9.5	12	5	38.75	49.8
2	Unpruned	13.5	21	15	14	63.5	81.6
3	Pruned	8.5	12.25	11	6.5	38.25	49.2
4	Unpruned	11.5	14.5	14.5	13.5	54	69.4
5	Pruned	10	10	10.5	8	38.5	49.5
6	Unpruned	13	16.5	18	14.5	62	79.7
7	Pruned	10.5	10.5	10.5	7.5	39	50.1
8	Unpruned	14	15	15.5	15.5	60	77.1
9	Pruned	8	9.5	10	9.5	37	47.6
10	Unpruned	13	14	13.5	12	52.5	67.5
11	Pruned	10.5	12.5	11	9.5	43.5	55.9
12	Unpruned	15.5	17	14	13	59.5	76.5
13	Pruned	8.5	11.5	9	8	37	47.6
14	Unpruned	15.5	13.5	14.5	13.5	57	73.3
15	Pruned	8.5	11.5	9.5	7.5	37	47.6
16	Unpruned	12.5	14.5	14.5	9	50.5	64.9
17	Pruned	8.5	10.75	9.5	8	36.75	47.2
18	Unpruned	14	13	14.5	11	52.5	67.5
Total	Pruned	85.25	98	93	69.5	345.75	49.4
	Unpruned	122.5	13.9	134	116	511.5	73.1

In the above table are given 72 weights, involving 36 comparisons, every one of which is in favor of the unpruned. Reducing to acres and bushels, we find the average decrease per acre due to root-pruning to be 24 bu., or 32 per cent. The least average difference per acre for any plat was 21.3 bu.; the greatest, 26.6 bu. The least average difference of two rows for the four plats was 17 bu. per acre; the greatest, 32. With such results it is conclusive that the difference in yield is due to the root-pruning.

In 1888 the root-pruning was to the depth of three inches; in each of the following years, to the depth of four inches. The decrease from the more shallow pruning was very much less than from the deeper pruning of the other years. The decrease was greatest in 1891, the year with the least rainfall during the growing season; and next greatest in 1890, in which year the rainfall was also deficient.

EFFECT OF ROOT-PRUNING UPON YIELD OF CORN, 1888, 1889, 1890, 1891.

Kind of cultivation.	1888.			1889.			1890.			1891.		
	Unpruned..	Pruned	Differences.	Unpruned..	Pruned	Differences.	Unpruned..	Pruned	Differences.	Unpruned..	Pruned	Differences.
Shallow, ordinary.....	97	91	6	90.9	78.3	12.6	78.7	55	23.7	70	48.7	21.3
Deep, ordinary.....	87	83.2	3.8	80.9	67.6	13.3	70.8	50.7	20.1	79.4	56	23.4
None, weeds scraped off..	94	85.5	8.5	85.8	68.4	17.4	76.7	61.5	15.2	66.3	39.7	26.6
Averages	92.7	86.6	6.1	85.9	71.4	14.4	75.4	55.7	19.7	71.9	48.1	23.8

Experiment No. 11. Effect of Fertilizers on Corn.

As stated in former bulletins, no important effect on yield of corn has been produced by the application of any of the more common forms of artificial manures to the fertile prairie lands on the University farms. The application of stable manure has, almost without exception, increased the yield, but not in all cases enough to repay directly the outlay. These results have little bearing on the effect of any kind of manure on less fertile lands, or even on naturally fertile soils after they have been cropped a long series of years without manuring.

For three years experiments have been tried at different points in this state, about on the latitude of St. Louis, in the light-colored soil of that region. Owing to unfavorable conditions—drouth and storms—or to injuries by insects, the results have been very unsatisfactory. The effect of applying stable manure has been uniformly good. With regard to the use of commercial fertilizers the experiments have not been conclusive, for the reasons given; but the indications are that they have not increased the yield enough to repay their cost.

Experiment No. 90. Growth of the Corn Plant; Increase of its Dry Matter.

For three years observations have been made on the rate of growth and on the rate of increase of dry matter in the corn plant.

The results each year have shown that there is relatively very little dry matter in the corn plant in the early stages of its growth. When the plant has reached its full height there has been less than 50 per cent, and when the ears are in the soft milk stage there has been not more than 75 per cent as much dry matter in the whole plant as when it has fully matured. Loss of leaves and tassels may reduce the weight; otherwise the dry matter increases until the plant is fully mature.

For three years plats of corn have been cut for fodder at three different periods; as nearly as might be when the ears were in the milk stage, when they were nearly mature, and when the plant was fully ripened. In each year there was a noticeably less yield, both of the

whole crop and of the grain, from the early harvested plats than from either of the others. The yield of corn has been largest from the fully ripened plats.

These experiments, and the feeding tests which have accompanied them, will be repeated and fully reported. Without taking into account palatibility and digestibility of the fodder at different periods, the three trials indicate that very early cutting of corn, either for dry fodder or for ensilage, involves an important loss of food; but convenience, danger of loss if the corn is left standing until fully mature, and other considerations will influence the decision as to the best time to harvest the crop

Experiment No. 134. Corn, Effect of Removing Tassels.

The tassels on alternate rows of four-tenths of an acre of Burr's white corn were removed as soon as they appeared. Each of the thirty rows was husked and weighed separately. The total difference between those having the tassels removed and those not removed was but one pound, thus showing no effect from removing tassels. In similar trials with sweet corn the yield was somewhat reduced when the tassels were removed.

Removing the tops by cutting them off above the ears just before the leaves began to turn brown had no appreciable effect upon the yield of grain.

GENERAL CONCLUSIONS AND SUGGESTIONS.

Central Illinois has a soil and climate admirably adapted to the production of good corn. On the grounds of the Agricultural Experiment Station the average yield for four successive years of all the medium maturing varieties tested has been 73 bushels of air-dry shelled corn per acre. These yields have been secured almost exclusively without manuring or unusual cost of cultivation.

The soil has great natural fertility; is easily worked; is loose and sufficiently porous to a considerable depth; has great capillary attraction. Applying stable manure, or adding to the store of vegetable matter by plowing under a clover or grass sod, usually increases the yield. Applying any of the artificial manures ordinarily used in this country, as a rule, produces little effect. Deep stirring of the soil in preparation for the crop is not necessary. Air, water, and the roots of the corn readily find their way into this soil, even if it has not been stirred. In times of drought the soil has a marvelous power of bringing moisture from the depths of the subsoil and retaining it for the use of plants.

The climate is of the best for the corn plant. A season of nearly five months, free from frosts, may be expected. The average summer temperature is high. There is much sunshine, and, usually, frequent showers give sufficient rainfall.

For this soil and climate the best guarantees of a good crop of corn seem to be: (1) A good variety. (2) A good stand. (3) Keeping the soil free from weeds with the least disturbance practicable of the roots. A low cost for the crop will depend mainly on the ability to secure these conditions without unnecessary expenditure of money or labor.

There are many excellent varieties in cultivation in Illinois. Usually it is unnecessary, often a serious mistake, to send to a distance and pay high prices for seed corn. The claims made for many varieties prominently advertised are greatly exaggerated. There is no variety that we can rely on to produce 100 bu. per acre of dry shelled corn with average good soil, season, and cultivation. No variety suitable for general cultivation in central Illinois will mature in 90 days. The best varieties tested at the Station have a union of several desirable qualities in a fair degree rather than any one good point developed to an extraordinary degree. No very early maturing variety has given a large yield. No variety with remarkably large ears has matured sufficiently early to be very desirable. Neither the yield nor the feeding value of a variety depends on the color or smoothness of the kernels.

The varieties which have given the best satisfaction at the Station have had, in good seasons, stalks averaging 8 to 10 ft. high, producing ears at a height of about four feet; good ears, averaging 9 to 10 in. long and 2 to 2½ in. in diameter; cobs, about one-half the diameter of the ear; from 14 to 20 rows of kernels, with as little space as possible between the rows; kernels well covering the butt and tip of the ear. A reasonable uniformity in the diameter of the ear until near the tip is desirable; but some of the best varieties taper considerably. The time of ripening of these varieties has been from Sept. 10th to Sept. 20th.

Failure to secure a sufficient number and a uniform distribution of stalks is one of the most common causes of poor yields of corn. Stalks and ears of the largest size are secured by planting a less number than is necessary to secure the largest yield. With the rows 3 ft. 8 in. apart, planting four kernels in a hill has given larger yields than a less number. The number of stalks being the same and their distribution uniform, and the land being kept equally free from weeds, there has been no material difference in yield between planting in hills and planting in drills. When the largest and most valuable yield of both grain and stalks is desired the planting should be at a rate of not less than one kernel each six inches in the row. Poor seed, poor preparation of the soil, failure to cover properly the seed, or injury by insects, birds, or squirrels, or in cultivation may reduce the number of stalks far below the number of kernels planted.

Planting by May 1st is safe practice, but does not insure a larger yield than planting ten days to two weeks later. Medium early planting, if the soil is stirred just before planting, may make less cultivation necessary afterwards than very early planting. Except when the soil

is very dry, covering the seed well, one to two inches, is better than deeper covering.

In this soil the chief good from cultivation seems to be in killing the weeds rather than in loosening the soil. Injuring the roots of the plants should be avoided as far as possible. Cultivating four inches deep, within six to ten inches of the stalks, after they have made a fair growth, will destroy many of the roots. Shallow cultivation, if the work is equally well done, is better than deep cultivation. More frequent cultivation than is necessary to keep the surface loose and free from weeds is not profitable.

Cutting or husking corn before it is fairly mature causes loss; but letting the corn stand till fully mature may result in even greater loss, either from storms or from the greater cost of late harvesting, or from both causes combined. Probably the greatest food value per acre is secured, if either the grain or the stalks are to be fed early in the season, by planting early maturing varieties, even though the yield be less.

G. E. MORROW, A.M., *Agriculturist.*
F. D. GARDNER, B.S., *Assistant Agriculturist.*

All communications intended for the Station should be addressed, not to any person, but to the

AGRICULTURAL EXPERIMENT STATION, CHAMPAIGN, ILLINOIS.

The bulletins of the Experiment Station will be sent free of all charges to persons engaged in farming who may request that they be sent.

GEORGE E. MORROW,
President Board of Direction.

ORGANIZATION.

BOARD OF TRUSTEES OF THE UNIVERSITY OF ILLINOIS.

SAMUEL A. BULLARD, Springfield, President.
JOSEPH W. FIFER, Springfield, Governor of Illinois.
LAFAYETTE FUNK, Shirley, President State Board of Agriculture.
HENRY RAAB, Springfield, Superintendent of Public Instruction.

EMORY COBB, Kankakee.
W. W. CLEMENS, Marion.
JOHN H. BRYANT, Princeton.
GEORGE R. SHAWHAN, Urbana.
FRANCIS M. McKAY, Chicago.
RICHARD P. MORGAN, Dwight.
NELSON W. GRAHAM, Carbondale.

BOARD OF DIRECTION OF THE EXPERIMENT STATION.

GEORGE E. MORROW, A.M., Champaign, Professor of Agriculture, President.
E. E. CHESTER, Champaign, of State Board of Agriculture.
HENRY M. DUNLAP, Savoy, of State Horticultural Society
H. B. GURLER, DeKalb, of State Dairymen's Association.
EMORY COBB, Kankakee, Trustee of the University.
LAFAYETTE FUNK, Shirley, Trustee of the University.
THOMAS J. BURRILL, Ph.D., Urbana, Professor of Botany and Horticulture.
STEPHEN A. FORBES, Ph.D., Champaign, Professor of Zoölogy and Entomology.
EDWARD H. FARRINGTON, M.S., Champaign, Chemist of Station.

THE STATION STAFF.

GEORGE E. MORROW, A.M., Agriculturist, President of Board of Direction.
WILLIAM L. PILLSBURY, A.M., Champaign, Secretary.
THOMAS J. BURRILL, Ph.D., Horticulturist and Botanist.
EDWARD H. FARRINGTON, M.S., Chemist.
STEPHEN A. FORBES, Ph.D., Consulting Entomologist.
DONALD McINTOSH, V.S., Consulting Veterinarian.
GEORGE W. McCLUER, B.S., Assistant Horticulturist.
GEORGE P. CLINTON, B.S., Assistant Botanist.
E. K. NELSON, Assistant Chemist.
FRANK D. GARDNER, B.S., Assistant Agriculturist.